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**GOLF SWING TRAINING APPARATUS AND METHOD OF USING THE SAME**

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and  
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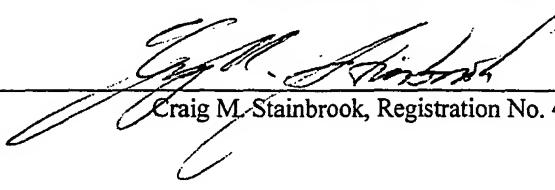
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## GOLF SWING TRAINING APPARATUS AND METHOD OF USING THE SAME

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### CROSS REFERENCE TO RELATED APPLICATIONS

10 [0001] The present application claims the benefit of the filing date of U.S. Provisional Patent Application Serial Number 60/400,866, filed 8/2/2002 (2 August 2002).

### STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

15 [0002] Not applicable.

### REFERENCE TO A MICROFICHE APPENDIX

20 [0003] Not applicable.

### TECHNICAL FIELD

25 [0004] The present invention relates generally to golf swing training devices, and more particularly to a method and apparatus for training proper swing mechanics, and more particularly still, to a method and apparatus for training proper arm and wrist motions throughout the golf swing.

BACKGROUND INFORMATION AND DISCUSSION OF RELATED ART

- [0005] General Background Discussion: The sport of golf is perhaps without rival in the high level of skill required to play the game well, and it is, therefore, also without rival in its difficulty.
- 5 Despite its apparent simplicity, it is an inherently frustrating and only occasionally and elusively rewarding game. However, those who persevere often become avid in their pursuit of improvement and reverential in their appreciation of the beauty of a fine swing and a well struck shot. In part this is because golf ranks highest among sports in demanding extremely precise, fine motor movements for skillful performance, and it may well rank highest for having the smallest
- 10 margins for error: only a degree of misalignment of the clubface during impact over the course of a round can mean the difference between playing in the fairway and hitting greens all day long, or playing out of the bunkers and rough and regularly rehitting tee shots that have sailed out of bounds. For that reason golf vastly surpasses any other sport in enticing both professional and recreational enthusiasts to devise aids to improvement. Indeed, it would be the epitome of
- 15 understatement to say that the field of golf instruction is replete with swing aids. Flip through the back pages of any current golf publication, or conduct an Internet search for golf swing training aids, and you will run a gauntlet of devices to straighten the left arm, structure the turn, still the head, correct the swing plane, delay the release, increase power, and otherwise make your swing repeatable and perfect -- or so go the claims.
- 20 [0006] The discriminating reader understands that most claims about the advantages of swing training devices amount to little more than puffery, and that many devices are simply flawed in concept and therefore promote a faulty understanding of proper swing biomechanics. This does not even begin to discourage creative individuals from trying to invent something that will help

the enthusiastic golfer. Accordingly, there is an enduring need for simple, biomechanically appropriate aids for swing improvement. This is especially true for the autodidact golfer.

[0007] Although no single part of the entire golf swing can be discounted in importance, from the address position to the finish, arm and wrist motions throughout the swing are of paramount 5 importance. Proper arm and wrist actions in the backswing fundamental position the golfer to deliver the clubhead and clubface to and through the resting ball with the power and directional controls to send the ball flying to the intended target (that is, if all goes well). While not impossible, when moving to strike the ball in the downswing, it is difficult to correct for even minor flaws in backswing arm and wrist mechanics, even when shot preparation, grip, address 10 positioning and alignment, have been flawlessly executed. Neurological limitations (i.e., nerve impulse conduction and information processing speeds) and the angular forces generated in the downswing each make it nearly impossible to correct for early mistakes on the way down. So to set up the optimum downswing, it is imperative to execute proper motions from the address position throughout the backswing to the top of the set or transition position.

[0008] A question arises as to how one knows one is executing correct motions, that is, without 15 an ever-present teacher. One priceless means of obtaining swing feedback is to watch the flight of the ball. It is little more than kindergarten science to note that the flight of the ball provides the golfer with immediate feedback about the nature and quality of impact. However, the experienced, knowledgeable golfer extrapolates or infers a tremendous amount of information 20 from ball flight about how the entire club moved in the downswing and through impact and, even more usefully, the specific body mechanics that produced the particular impact, including postural conditions at address, backswing motions, and downswing mechanics. And experienced golfers

may make corrections in subsequent swings based on this information. Unfortunately, to even the most experienced golfer, the flight of the ball is not perfectly informative about swing mechanics. While it perfectly indicates impact conditions, it does not pinpoint with precision and specificity the movement conditions that caused the impact. Instead, it merely suggests several possibilities.

5 [0009] Ultimately, the best feedback mechanism, and the greatest assurance of continued skillful performance, rests in a finely tuned and trained kinesthetic and proprioceptive awareness of a finely tuned and trained swing, supported by a solid understanding of the proper mechanics of the swing. En route to this achievement, many golfers benefit by getting secondary mechanical aid and feedback about the execution of the stroke; secondary, that is, to the flight of the ball. Many 10 golf students hire teachers to provide this assistance. However, truly competent teachers are rare, they can be expensive, and they are not available on demand and as needed for consultation and correction. To address these limitations, many good teachers provide their students with teaching aids that reinforce the feelings and the mechanics they are endeavoring to instill in their students, and many students benefit greatly by using those swing aids to obtain provide simple and direct 15 feedback and mechanical aid consistent with the lessons they are learning.

[0010] Swing Mechanics: Like all striking and throwing movements, the golf swing is skillfully executed only when done so ballistically; that is, when the downswing motion is initiated by a rapid muscular contraction after which the muscles primarily involved in accelerating the club around the body quickly relax (even before impact) and allow momentum to complete the 20 movement. This contrasts with tension movements, and, as suggested, this kind of movement is characteristic of throwing, striking, and also kicking. All such movements, when skillful, include a post/throw, post/impact phase termed the follow through, and the follow through is made possible

and facilitated by differentially relaxed muscles that allow the momentum of the extremities (and striking implement, if any) to carry forward unimpeded. It has been suggested by some kinesiologists that the very purpose of the follow through is to assure a ballistic type of movement.

5 [0011] While the present invention is not primarily directed to training the follow through, it should be noted that the follow through is nonetheless important for ensuring the proper sequence of muscle contractions and the proper differential relaxation required in the backswing and the downswing. Furthermore, planning for a proper follow through enables the brain to organize such complex, coordinated swing movements and to ensure that they are executed ballistically. With  
10 respect to movements generally, the brain is a teleological organ: it plans for the end. In the context of the golf swing, a properly planned finish helps to ensure that the brain recruits the right muscle groups to most efficiently and precisely execute the ballistic movements involved in a skilled golf swing. Thus, after a follow through and finish position have been learned, this phase of the swing can be "intended" to produce complementary physical and psychological effects.

15 [0012] However, skillful execution of the downswing and its complementary follow through first requires skillful execution of the preparatory backswing. To fully understand the present invention, it would be useful, therefore, to consider the sequence of muscle movements involved in the golf stroke backswing.

[0013] The backswing movement essentially proceeds from large proximal muscle groups to  
20 smaller distal groups (trunk and legs progressively outwardly to arms and hands). Using a right handed golfer as a model for descriptive purposes only, the following summary applies:

[0014] From the address position with the body essentially motionless, the skilled golfer initiates

the backswing motion in a unified fashion with the large muscles of the legs and trunk initiating a pivot on a fixed right leg. The abductor muscles of the left leg (adductor magnus, adductor longus, adductor brevis, and gracilis) gently push weight off the left foot while simultaneously the golfer begins pelvic rotation to the right in the transverse plane about a vertical axis, primarily in  
5 the right hip joint, and secondarily and diminishingly in the left hip joint as weight is transferred partly to the right foot. This is accomplished by using the outward rotators of the left leg (the gluteus maximus, assisted by the gluteus medius, posterior fibers, the abdominal muscles, spinal extensors, and quadratus lumborum), and the inward rotators of the right leg (gluteus minimus, gluteus medius, anterior fibers, and assisted by the tensor fasciae latae, adductor magnus, lower  
10 fibers, abdominals and spinal extensors, and quadratus lumborum).

[0015] Overlapping and generally following the foregoing sequence of muscle movements, the next sequence of muscle movements in the backswing involves rotation of the trunk in the thoracic spine. Rotation of the pelvis continues overall trunk rotation, but it quickly diminishes as the golfer gets set up on the right foot with a discernible but partial weight transfer. As pelvic  
15 rotation drops off, trunk rotation continues only as upper trunk (chest and shoulder) rotation with a twisting, rotary movement of the upper trunk and shoulders to the right in the transverse plane about an axis in the thoracic spine. Muscles employed include the external oblique abdominal muscle, semispinalis dorsi, left multifidus lumborum, rotatores, levatores costarum, and the left external oblique.

20 [0016] Thus far only trunk rotation has actuated club movement. However, now, carried slightly by the gentle momentum generated by pelvic and trunk rotation, the shoulders, arms, and hands begin to act independently. This takes place ideally when the hands reach approximately hip

height. Until that time, the function of the hands and arms is simply to maintain structure, to prevent the wrists from collapsing and allowing the club to be dragged rather than being simultaneously pushed and pulled in the initial stage of the backswing, and to preserve the relationship between the arms and shoulders established at address. Thus, with the shoulders and 5 arms in essentially the same configuration they were in at address, when the hands reach roughly hip height, in a continuous and smooth sequence of movements, the left arm begins to adduct (while flexion is avoided) and it also elevates while the right arm flexes with the biceps, and elevates and externally rotates with the middle deltoid, supraspinatus, infraspinatus and teres minor. Left arm adduction is caused by the pectoralis major, the anterior deltoid, subscapularis, 10 and coracobrachialis. The left scapula is abducted and tilted laterally by the serratus anterior. The right scapula is stabilized and only partly retracted, though it is primarily held in a relatively fixed position with the trapezius, subclavius, and serratus anterior. The motions continue to the termination or top of the backswing.

[0017] Again, commencing at approximately hip height, and in smoothly blended into the 15 overall arm movements, both the right and left wrists begin a small measure of radial flexion. At the option of the golfer, this action may be completed before the termination of the backswing or it may continue until the completion of the backswing. In some rare cases, golfers may prefer to reserve a measure of radial flexion that will occur during the rapid initiation of the downswing, but this is rarely controlled by any but the most skilled golfer, Ben Hogan, Jack Nicklaus, Sergio 20 Garcia, and Davis Love III being among the most notable examples.

[0018] When the golfer reaches the position at the top of the backswing, he should have the feeling of being coiled on and around the right leg. He should also be positioned in what might be

fashioned a "poised to throw" with the right arm. The left arm is, conversely, poised to pull. At this stage of the swing, the primary operative muscles needed for the downswing are dynamically stretched in preparation for a snap reflex initiation of the downswing.

[0019] The downswing proceeds next, as follows: From the top of the backswing (also known 5 as the set or transition position), the skilled golfer initiates the downswing motion with the abductor muscles of the right leg (adductor magnus, adductor longus, adductor brevis, and gracilis) to push weight off the right foot and laterally onto the left foot toward the target. This tilts the pelvic girdle laterally in the frontal plane so that the left iliac crest is raised above that of the right. Simultaneously, the golfer begins pelvic rotation to the left in the transverse plane about 10 a vertical axis, which axis is first in the right hip joint, until weight has been transferred, and then the left once a platform has been established on the left foot. This is accomplished by using the outward rotators of the right leg (the gluteus maximus, assisted by the gluteus medius, posterior fibers, the abdominal muscles, spinal extensors, and quadratus lumborum), and the inward rotators of the left leg (gluteus minimus, gluteus medius, anterior fibers, and assisted by the tensor 15 fasciae latae, adductor magnus, lower fibers, abdominals and spinal extensors, and quadratus lumborum). The rapid rotation left of the pelvis with a relative inert upper truck results in a lag of the upper trunk from the lower border of the rib cage.

[0020] Simultaneously tilting and rotating the pelvis by pushing off the right foot onto the left 20 foot (as described above) drops the golfer's elbow down toward the trunk and drops the hands into a position to deliver the clubhead on a geometrically correct path through impact. Without the proper coordination of these two actions, the path of the club is hopelessly wayward and the probability of striking a controlled shot lost.

[0021] Temporally overlapping and succeeding hip and overall trunk rotation, the next sequence of muscle movements in the downswing involves rotation of the trunk in the thoracic spine.

Rotation of the pelvis continues, and this rotation initiates overall trunk rotation, but on top of this rotation the golfer now augments pelvic-actuated chest and shoulder rotation with a twisting,

5 rotary movement of the upper trunk and shoulders to the left in the transverse plane about an axis in the thoracic spine using the external oblique abdominal muscle, semispinalis dorsi, right multifidus lumborum, rotatores, levatores costarum, and the right external oblique.

[0022] Finally, the shoulders, arms, and hands get into the act. Temporally overlapping but

generally driven by and following the trunk rotation, the golfer adducts the left scapula with the

10 trapezius, rhomboid major and rhomboid minor. The left arm is abducted and lowered with the

posterior deltoid, teres major, teres minor, infraspinatus, supraspinatus, and latissimus dorsi. In

coordination with these movements, the right arm is adducted at the shoulder with the anterior

deltoid, pectoralis major, pectoralis minor, serratus anterior, and coracobrachialis; extended at the

elbow with the triceps; and lowered primarily by the latissimus dorsi. Most lower arm and wrist

15 motions from this point forward are passive and accomplished by the angular momentum

generated by the preceding movements and entail little more than holding on to the grip of the

club. However, external rotation of the left arm and internal rotation of right, along with

supination of the left forearm and pronation of the right forearm. In a rapid, blended coordinated

action in both arms, both wrists undergo ulnar flexion (adduction) until they reach a moderately

20 flexed configuration at impact (just as they were at address by virtue of holding an angled club).

[0023] By the time the clubhead reaches impact, most of the muscular contraction has come to an end (particularly in the shoulders, arms, and wrists), and the skilled golfer carries forward into

the follow through by selectively relaxing all but the postural balancing and stabilizing muscles of the legs and back and allowing the angular momentum of the body, arms, and club to define the finish. Characteristically, the finish is structured as follows: the golfer is relaxed and balanced in an essentially upright posture with a majority of the weight on the left foot with the toe pointing generally toward the target line (as it was at address). The hips and shoulders have turned left so that the golfer is at least facing the target, and in especially flexible golfers the finish position may entail turning substantially beyond the point of facing the target. The arms, hands, and club are held generally above the left shoulder, having been swung into this position by unimpeded angular momentum. The club may tip or drop, from grip end to clubhead, downwardly toward the ground over the golfer's back, or it may be "wrapped around" the golfer and held at substantially shoulder level (this is a matter of personal preference and has little bearing on mechanics through impact).

10 The leading leg is generally straight or nearly straight, and the rear leg is relaxed and bent at the knee so that it nearly touches the knee of the leading leg. The right foot is gently balanced on its toe so that it is substantially pointing directly into the ground (i.e., straight up and down from heel to toe). To accomplish this position (without contriving it) the golfer must have begun the

15 downswing with a proper pelvic tilt (weight shift) and proper hip rotation, and thereafter the golfer must not have interfered with the angular forces generated by this blended lateral/rotational movement, but instead have cooperated with and complemented this movement with downswing arm, hand, and leg motions that involve appropriate differential relaxation and thus "allowing" the

20 swing to proceed via momentum. And to have executed the proper downswing, the golfer will have been greatly aided by having assumed a proper address position and made a mechanically sound backswing.

[0024] It is a common understanding among golf teachers that the proper execution of the entire golf swing necessarily entails proper timing, coordination, sequencing, and balance of the separate arm and wrist movements in relation to foot and knee action, and hip and trunk rotation, in both the backswing and downswing. It is commonly taught – though there are admittedly many exceptions – that the ideal sequence of muscle movements proceeds from the proximal, large muscles of the trunk and legs that initiate and drive the swing in both directions, followed by the proximal, small muscles of the upper extremities. However, pedagogically, it is difficult to teach control by teaching large muscle movements only. It is generally more efficient in teaching control to allow lower body and trunk motions to be governed by directly attention to the motions of the hands, wrists, and arms. This also turns out to be an efficient method of effecting a proper overall swing motion. This should not be surprising inasmuch as the arms and wrists move and control the hands throughout the swing, and the hands are the primary point for feedback as to club conditions. Furthermore, it is hand movement and hand orientation around which most of the trunk and leg movements are organized throughout the swing (from the point of view of planning and intention). These observations accord with the simple neurological fact that an extraordinary amount of brain space is dedicated to processing sensory input from the hands and to controlling muscle movements in the hands. It also accords with the phenomenology of actions involving manipulation generally. When it comes to complex movements in which the hands will execute control element, such as grasping a small object on the ground, the typical individual executing the movement is not for one moment concerned with how much to bend over, how to turn, how to reach out, and so forth. Instead, he simply reaches in coordination with all the other movements needed to deliver his hands to the object: turning, bending at the waist and knees,

reaching out, and grasping; and all of the gross motor movements are organized around the mandate from the hand – that is, when the hands must be moved through space to most efficiently execute a task, the brain organizes movements of all other parts of the body around that mandate.

[0025] This principle applies equally well in the golf swing. As the golfer intends his hands to move in a particular path and to make certain movements (e.g., rotational on-plane movements, if desired), his body will conform itself to the needs of the hands. This is best illustrated by taking exaggerated “inside out” or “outside in” swings. It is readily apparent that to take an exaggerated inside out swing requires significant hip slide toward the target at the start of the downswing; while an exaggerated outside in swing with its round housing characteristics requires that there be almost no hip slide forward. Thus, simply intending to move the hands in a particular path impels compatible gross movements of the trunk, shoulders, and arms.

[0026] Interestingly, despite the high degree of motor control that resides in the hands, arm and wrist actions are difficult to optimally coordinate and time with leg, hip, and trunk actions, and they are thus a particularly problematic area of the golf swing. Golfers are particularly vulnerable to changes in the rhythm and timing in their swings, particularly when it comes to timing arm and wrist motions with leg action and hip, trunk, and shoulder rotation. This is simply another way of saying that golfers have a great challenge in repeatedly executing the proper sequence of muscle movements in their precise temporal relationship to one another. This may be owing to the need to connect both arms (via the hands) on one implement and then to move them in unison throughout the swing. It may be due to the unusual nature of swinging on an inclined plane. Regardless of the cause, however, it is desirable to have a device that facilitates or induces proper arm and wrist mechanics and timing, trains muscle strength and stamina, and that simultaneously

provides real time visual feedback to the golfer about the precision with which he or she is making backswing and downswing motions.

[0027] The Swing Plane: It has become fashionable in recent years to talk about the swing plane. While few studies have conclusively demonstrated the pedagogical impact of the swing 5 plane concept, it is nonetheless an intuitively appealing model that comports with fundamental mechanics. Additionally, considerable anecdotal evidence shows it to be a powerful controlling concept that makes it easy for the learning golfer to control both overall and discrete motions in the swing.

[0028] The modern concept of the swing plane was first advanced by Ben Hogan in his 1957 10 classic, *Five Lessons: The Modern Fundamentals of Golf*. In that book, Hogan likened the swing plane to a large flat pane of glass inclined from the intended line of flight of the ball and generally resting on the shoulders of the golfer (the glass has a hole in it for the golfer's head). As is 15 geometrically required, the glass pane intersected the ground in a line which was coincident with the line of flight (at least at address). To control club movement, the golfer ideally swung the clubhead underneath the plane throughout the swing. However, Hogan mysteriously introduced a slight shift in the plane line in the downswing, evidently to account for the apparent motion of the 20 clubhead outward and away from the golfer from about hip height through impact. This unfortunate misunderstanding of the swing plane undermined its conceptual simplicity and significantly compromised its effectiveness as a teaching device. Additionally, Hogan never made entirely clear what part or parts of the club must move on the swing plane (if any) during any particular phase of the swing, and it was therefore difficult to ascertain precisely how to use the model. The general idea appeared to be only that the club must remain under the plane. Even so,

Hogan's swing plane image (beautifully illustrated by Anthony Ravelli) continued to intrigue and guide many teachers and writers in their efforts at understanding the swing.

[0029] Several years later, in the mid-1970s, Homer Kelley clearly explained the swing plane with geometrical rigor. In his book *The Golfing Machine*, Kelley describes the swing plane as the 5 two dimensional geometric structure on which the entire club moves throughout the golf swing. Like Hogan's plane, Kelley pictured the swing plane as a flat pane of glass intersecting the ground in a line, which is best referred to as a plane line; again the plane line was identical with the intended initial line of flight of the ball. However, unlike Hogan's plane, Kelley's plane has a dynamically changing inclined angle during the swing, and the entire club remains on the plane 10 throughout the swing. Regardless of changes in the plane angle, the plane line remains fixed on the intended line of flight. In Kelley's view, during the course of the swing, as the golfer begins the backswing, the plane may remain relatively still as the club effectively rides up the inclined plane. According to the simple geometry of the plane, one of two lines extended from each end of the golf club shaft will either point to or be parallel to the plane line at any point in the swing. In 15 starting the backswing, a line extending from the clubhead end of the shaft will point to the plane line. At approximately hip height, the club shaft will be parallel to the plane line, and the lines extending from either end of the club will be parallel to the plane line. As the golfer continues the backswing and the club proceeds up the plane, the wrists are typically cocked and the line extending from the handle or grip end of the club will point to the plane line; it will continue to do 20 so unless the swing proceeds to the point at which the club shaft is parallel to the plane of the ground, in which event, if it has remained on plane, the lines extending from both ends of the club will be parallel to the plane line once again. In precisely the same fashion, this geometry applies to

the downswing geometry.

[0030] A clarification is in order: For purposes of visualizing Kelley's concept of the swing plane, talking about the entire golf club is most convenient. But in Kelley's model, the geometry of the swing was subordinate to the physics of the swing, and under the influence of the angular momentum generated in the swing (in each direction), it was not the clubshaft *per se* that traveled on the swing plane; rather, it was a line extending from the longitudinal center of gravity of the club (i.e., the sweet spot in the clubhead) and through the lowest point of the hands in the golfer's grip.

[0031] In the late 1970s and early 1980s, Kelley demonstrated this phenomenon by attaching one flashlight to a point proximate the grip end of the club and another flashlight proximate the head end of the club, each shining a beam of light substantially parallel to the clubshaft but in opposite directions. An on plane swing caused one or the other of the light beams to track a straight line on the ground (corresponding to the plane line/line of flight) except at those points in the swing when the club was parallel to the ground. However, Kelley insisted that the ideal swing plane defined a single and unmoving plane line throughout the entire swing, even though the plane angle might change or shift dramatically during the swing.

[0032] It is the observation of the present inventors that there is an intimate, inextricable, and reciprocal relationship between correct swing mechanics and correct swing geometry. More specifically, it is the observation of the present inventors that by learning to swing on a proper swing plane, a golfer will be induced into making the proper sequence of muscle movements; and by learning to make the proper sequence of muscle movements, the golfer will be induced into swinging on the proper swing plane. Stated somewhat differently, proper swing geometry will

inform muscle movement, and proper muscle movement will inform proper swing geometry.

[0033] It is also the observation of the present inventors that the ideal swing plane does not define a single plane line, or line at which the plane intersects the ground. Instead, the ideal plane actually shifts at two critical points in the swing: the first time in the backswing, when the club has

5 reached a point where it is parallel to the ground and the radial flexion (i.e., wrist cock) begins to load the wrists by angling the club relative to the left arm. At this point, the plane line moves inside the target line plane line and onto a line proximate the toes of the golfer. The shift occurs in reverse on the downswing after the club reaches parallel with the ground once again as the wrists rapidly uncock to release the loading created in the backswing and send the clubhead into impact.

10 Accordingly, unique to the present invention, and to the inventive method of teaching the proper swing plane, the present inventors provide a method for tracking movement on the proper plane by monitoring club motion relative to the two most important controlling lines in the swing: the (1) target line, and (2) a line positioned slightly closer to the golfer than the target line, referred to herein as the toe line and/or the clubhead line. It would therefore be desirable to have a device

15 that combined a kinesthetic and mechanical aid to making proper muscle movements with an aid for providing visual feedback to assist in swinging on the proper swing plane.

[0034] Related Art: Several golf swing training devices have been proposed to assist in habituating the golfer to good arm and wrist motions. Additionally, several prior art devices have been proposed to provide golfers with visual feedback regarding club movement relative to the

20 ideal swing plane. Among the known prior art disclosures are the following.

[0035] U.S. Pat. No. 4,903,968, to Hargrave, discloses a swing training apparatus in which a golfer swings an elongated stick (an ersatz club) which emits light from each end. An upstanding

frame provides a support for sensor/alarm units which are responsive to the light emitted from each end of the implement. The apparatus purportedly trains the golfer to make a technically correct swing motion by allowing the user to practice the golf swing motion slowly, stopping and holding the motion at each of several discrete, sequential positions of club alignment, thus

5 imparting memory of the complete swing motion to the muscles involved in performing the swing motion.

[0036] U.S. Pat. No. 5,082,282, to Hernberg, teaches a swing training device comprising a golf club having a first light which projects a beam of light out of the head towards a surface, a second light for projecting a second beam of light in a direction opposite the head. The invention also

10 includes a linear guiding indicia to be placed on the surface on which the golfer is standing to provide visual feedback regarding the golfer's swing.

[0037] U.S. Pat. No. 5,467,991 to White, IV, et al, shows a self-contained portable unit attachable to and detachable from the shaft of a golf club. The unit includes a base mounting plate supporting a pair of light emitting diodes (LED) which project light beams in opposite directions parallel to the shaft of the club. Using a target line, such as the edge of a rug, a piece of string, or line on a hardwood floor, an imaginary ball is addressed in the normal fashion so that the light towards the head traces the target line and then once the club passes a parallel position the second light picks up the same target line while the swing is continued to the top of the swing. It is

15 entirely unclear what novelty and non-obviousness resides in this device, inasmuch as Homer Kelley constructed, showed, and publicly used such a device in the early 1980s, the one difference

20 being that he employed flashlights rather than LEDs as light sources.

[0038] U.S. Pat. No. 5,544,888, to Pellegrini, discloses yet another version of a swing training

device adapted for removable attachment to the handle of a standard golf club. The device includes a light source that generates a light beam coaxially and outwardly from the grip end of the club. The light source is enclosed within a pair of housings that are threadably coupled, such that the light source is activated by rotating one of the housings relative to the other. The method 5 of activation employs an elastomeric member that permits current flow from a battery to the light source upon the elastomeric member being sufficiently compressed in order to achieve electrical contact between one of the battery's contacts and the housing in which the elastomeric member is contained.

[0039] U.S. Pat. No. 5,759,110, to Seibel, et al, illustrates a swing training device including a 10 housing which contains a light source, a power source and a driving circuit for generating a beam. Optics, including a collimator lens and a beam splitter are placed in the housing in order to split a beam so that a first beam is radiated along the longitudinal axis of the golf club shaft and a second beam is radiated at roughly a 90.degree. angle relative to the first beam. A gravity switch in the training device provides that the beams are only radiated during the backswing and follow through 15 of the swing. The apparatus also includes a mat with indicia for properly aligning lighted dots generated on the mat by the laser beams in order that the golfer may develop a proper swing form.

[0040] U.S. Pat. No. 5,924,934, to Hamilton, teaches a swing training device comprising a 20 practice golf club shortened for carrying in luggage. It includes a shaft with grips on each end, and a head projecting transversely from one end for visual alignment of the club. It has a laser beam projecting from one end of the shaft along the axis of the shaft. The golfer grips the first end of the shaft and swings the practice club, causing the laser to trace a line on the floor that provides feedback about the lower part of the swing. The golfer grips the second end of the shaft and

swings the practice club, causing the laser to trace a line on the floor that provides feedback about the upper part of the swing.

[0041] U.S. Pat. No. 5,954,592, to Laffer et al., discloses still another version of a swing training system that includes a light source that generates a light beam from the grip end of a golf club and a floor mat having graphics showing one or more preferred light beam paths. Upon 5 swinging the golf club such that the light beam projects upon the mat following the light beam path golfers are taught how to swing the club along a preferred swing plane. (Interestingly, although the inventor employed the term "swing plane" to describe the geometrical description of club movement in the swing, it would be anything but planar were the light beam to describe an 10 arcuate path on the floor mat.)

[0042] U.S. Pat. No. 6,488,592 to Boatner, teaches a swing training method that entails the use of a conventional golf club, a handle laser removably attached to a butt end of the golf club's handle, a shaft laser removably attached to the golf club's shaft, and a retractable target line having a tape marked with a centerline and at least one golf ball image. The handle laser is 15 installed so as to shine a handle laser beam along the golf club's shaft centerline extension in a direction opposite the golf club's head. The shaft laser is installed so as to shine a shaft laser beam parallel to the golf club shaft such that the shaft laser beam passes immediately in front of the area of the head intended to strike a golf ball. The method includes the steps of addressing the golf ball 20 image and swinging conventionally, ensuring that during appropriate arcs of the swing, either the handle laser beam or the shaft laser beam shine on the tape centerline, thus teaching the golf student to execute the entire swing within the perfect swing plane. Once again, in view of Homer Kelley's early innovations, it is hard to identify the patentable features of this invention.

[0043] Swing training devices directed to the arm and wrist motions include U.S. Pat. No. 4,023,812, to Lorang, which discloses a wrist action training apparatus having a leg mounted on a golf club proximate the player's hands. The leg lies on the off-target side of the shaft and angles sideways and outwardly to a point about opposite the juncture of the player's hands on the club.

5 This locates the upper contact end of the leg (in the ball address position of the club) spaced outwardly from the hands in an off-target direction with the shaft extending forwardly from the player's forearms. When the player's hands on the backswing reach about hip level, he cocks his wrists in an off-target direction moving the shaft from the forwardly extending position relative to his forearms to a near right angle position relative to his off-target forearm. This cocking of the  
10 wrist pivots the club and swings the attached leg in an arc thereby bringing the contact end of the leg into engagement with the off-target forearm of the player. This shows the player he has fully cocked his wrists. A sound signal "clicker" device is actuated at the contact end of the leg and emits a "click" signal upon a full wrist cock. Upon downswing uncocking of the wrists, the "click" signal again emits at the point of the uncocking. Also, should the player relax his wrist cock  
15 inadvertently, the "click" signal so advises him.

[0044] A more elaborate, but less convenient device is shown in U.S. Pat. No. 6,224,522, to Ervin, which discloses a swing training aid having an elongated handle having a hand grip end and a weighted end. A foot plate includes one or more rigidly secured connection features to which a removable, stretchable tether is attached. The tether is then tied at a point between the grip and  
20 weighted ends of the club. The connection point on the handle is preferably a hook which doubles as a wrist indicator. The length of the tether is adjustable so as to resist upward movement of the handle when swung by the user to promote training and exercise with respect to the sport. Two

tethers may also be used, each being tied to the foot plate and handle in the manner described so that backswing and downswing portions of the swing can be trained simultaneously.

[0045] Finally, PCT Pat. Appl. Ser. No. PCT/US98/25321, bearing International Publication Number WO 99/26705, filed by Kallassy, discloses a golf swing training aid comprising a golf club having a contoured split grip which includes a slidable portion for the lower hand. This enables the user to properly grip the club at address and thereafter to separate his or her hands progressively during a backswing and then to bring them together progressively during the downswing.

[0046] The foregoing patents reflect the current state of the art of which the present inventor is aware. Reference to, and discussion of, these patents is intended to aid in discharging Applicant's acknowledged duty of candor in disclosing information that may be relevant to the examination of claims to the present invention. However, it is respectfully submitted that none of the above-indicated patents disclose, teach, suggest, show, or otherwise render obvious, either singly or when considered in combination, the invention described and claimed herein.

15

#### BRIEF SUMMARY OF THE INVENTION

[0047] The present invention is a golf swing training apparatus comprising a modified golf club and including a shaft with a longitudinal axis, a clubhead end, and a grip end, and a split-handled grip affixed to the grip end. The split-handled grip includes a fixed upper grip portion with an upper end and a lower end, and a slidable lower grip portion having an upper end and a lower end. The fixed upper grip portion is adapted for gripping with the non-dominant hand in the golf swing and the slidable lower grip portion is adapted for gripping with the dominant hand. A

weighted mass, preferably a clubhead, is attached to the clubhead end of the shaft. A primary housing is adjustably positioned and affixed to the shaft between the grip and the mass on the clubhead end and includes at least one throughhole for removable insertion of either light emitting means or a swing weight, or both simultaneously. A first light emitting means, preferably a laser, 5 is removably inserted into one of the throughholes in the primary housing for directing a first beam of light downwardly and parallel to the shaft. A secondary housing is removably attached to the primary housing and includes a throughhole in which second light emitting means, also preferably a laser, is removably inserted, for directing a second beam of light upwardly and parallel to the shaft. A spring or other biasing means is interposed between the slidable lower grip 10 and the primary housing.

**[0048]** It is therefore an object of the present invention to provide a new and improved swing training aid that has means for selectively attaching weights for training golf swing muscle strength and endurance.

15 **[0049]** It is another object of the present invention to provide a golf swing training apparatus having visual feedback means for training a golfer to swing on a proper swing plane.

**[0050]** A further object or feature of the present invention is to provide a golf swing training apparatus having a split handle grip that permits the user to selectively separate and approximate the hands during any phase of the golf swing, thereby providing means to induce mechanically correct arm and wrist movements.

20 **[0051]** An even further object of the present invention is to provide a golf swing training aid that combines means to induce a mechanically correct sequence of muscle movements, visual feedback means for training a proper swing path, and resistance means for training muscle

endurance.

[0052] Yet another object of the present invention is to provide a swing training method that teaches swing mechanics, trains precision club path motion, and conditions muscles for golf.

[0053] Other novel features which are characteristic of the invention, as to organization and method of operation, together with further objects and advantages thereof will be better understood from the following description considered in connection with the accompanying drawings, in which preferred embodiments of the invention are illustrated by way of example. It is to be expressly understood, however, that the drawings are for illustration and description only and are not intended as a definition of the limits of the invention. The various features of novelty 5 which characterize the invention are pointed out with particularity in the claims annexed to and forming part of this disclosure. The invention resides not in any one of these features taken alone, 10 but rather in the particular combination of all of its structures for the functions specified.

[0054] There has thus been broadly outlined the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that 15 the present contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and which will form additional subject matter of the claims appended hereto. Those skilled in the art will appreciate that the conception upon which this disclosure is based readily may be utilized as a basis for the designing of other structures, methods and systems for carrying out the several purposes of the present invention. It 20 is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

[0055] Further, the purpose of the Abstract is to enable the U.S. Patent and Trade-mark Office

and the public generally, and especially the scientists, engineers and practitioners in the art who are not familiar with patent or legal terms or phraseology, to determine quickly from a cursory inspection the nature and essence of the technical disclosure of the application. The Abstract is neither intended to define the invention of this application, which is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

5 [0056] Certain terminology and derivations thereof may be used in the following description for convenience in reference only, and will not be limiting. For example, words such as "upward," "downward," "left," and "right" would refer to directions in the drawings to which reference is made unless otherwise stated. Similarly, words such as "inward" and "outward" would refer to 10 directions toward and away from, respectively, the geometric center of a device or area and designated parts thereof. References in the singular tense include the plural, and vice versa, unless otherwise noted.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

15 [0057] The invention will be better understood and objects other than those set forth above will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawing wherein:

[0058] FIG. 1 is a perspective view of the golf swing training apparatus of the present invention;

20 [0059] FIG. 2 is an exploded perspective view of the apparatus of FIG. 1;

[0060] FIG. 3 is a perspective view showing the club shaft and several possible exterior surface shapes;

[0061] FIG. 4 is a perspective view showing details of the split grip portion of the inventive apparatus, and further showing preferred internal cross-sectional shapes of the upper and lower grips;

[0062] FIG. 4A is a perspective view showing detail of the end, interior and exterior shapes of the upper grip;

[0063] FIG. 4B is a perspective view showing detail of the interior and exterior shapes of the lower grip;

[0064] FIG. 5 is a partial exploded view showing details of the laser housings and their mounting structures;

[0065] FIG. 6 is a partially exploded perspective view of the apparatus of FIGS. 1 and 2, showing the primary and telescopic laser housings detached from the golf club shaft;

[0066] FIG. 7 is a perspective view showing the split grip portion of the inventive apparatus substantially separated;

[0067] FIG. 8 is a perspective view of a second preferred embodiment of the swing training apparatus of the present invention;

[0068] FIG. 9 is a perspective view of the swing plane indicator boards employed in connection with the inventive swing training aid to provide a swing training method;

[0069] FIG. 10 is a side perspective view showing a golfer at address, holding the swing training aid of the present invention and standing relative to the swing training boards employed in the present inventive method;

[0070] FIG. 11 is a front perspective view of the golfer beginning the swing takeaway;

[0071] FIG. 12 is a front perspective view showing (1) the golfer with his hands at

approximately hip height in the backswing and beginning to split his hands using the split grip, and

(2) use of the extension rod in visualizing proper swing plane motion;

**[0072]** FIG. 13 is a side perspective view of the golfer shown in FIG. 12; and

**[0073]** FIG. 14 is a superimposed front perspective view showing three positions of the golfer

5 using the inventive apparatus in a swing, including the top of the backswing, the position  
approximately halfway into the downswing, and a point slightly after impact.

**[0074]** Drawing Reference Number Index

FIGS. 1-8

- 100 swing training apparatus of the present invention
- 10 110 shaft
- 110a longitudinal axis of shaft
- 120 clubhead end of shaft
- 130 grip end of shaft
- 140 clubhead
- 15 150 non-cylindrical medial portion of shaft
- 160 lower cylindrical portion of shaft
- 170 upper cylindrical portion of shaft
- 180 tubing having the cross-sectional shape of a truncated cylinder
- 182 square tubing
- 20 184 triangular tubing
- 186 figure eight tubing
- 188 hexagonal (or generally polygonal) tubing

- 190 round with channel tubing
- 192 round with ridge tubing
- 200 split handle grip
- 210 fixed upper grip portion
- 5 220 upper end of upper grip portion
- 230 lower end of fixed upper grip portion
- 240 slidable/non-rotatable lower grip portion
- 250 upper end of lower grip portion
- 260 lower end of lower grip portion
- 10 270 contoured upper grip expansion
- 280 thumb slot
- 290 finger shield
- 300 head of upper grip expansion
- 310 opening at upper end of upper grip portion
- 15 320 expandible collar
- 330 throughhole for extension rod
- 340 extension rod
- 350 lower grip expansion
- 360 recess in lower grip expansion
- 20 370 upper edge of lower grip expansion
- 380 interior wall of upper grip portion
- 390 interior wall of lower grip portion

- 500 slide-stop/laser housing assembly
- 510 primary housing
- 515 channel in primary housing
- 520 secondary housing
- 5 530 first light emitting means (laser) [alternatively, a first weight]
- 540 second light emitting means (laser) [alternatively, a second weight]
- 550 threaded portion of first laser
- 560 threaded portion of second laser
- 570 bore hole
- 10 580 bore hole
- 590 threaded portion of bore hole 570
- 600 threaded portion of bore hole 580
- 610 upper end of primary housing
- 620 lower end of primary housing
- 15 630 first downwardly directed beam of light
- 640 second downwardly directed beam of light
- 650 third light emitting means [alternatively, a third weight]
- 660 upwardly directed beam of light
- 670 threaded portion of third light emitting means
- 20 680 threaded throughhole
- 690 retainer
- 700 spacer

- 710 bracket for attachment to retainer
- 720 switch for first light emitting means
- 730 switch for second light emitting means
- 740 keeper
- 5 745 interior hole of keeper
- 750 slot on keeper
- 753 upper end of slot 750
- 757 lower end stop of slot 750
- 760 slot on keeper
- 10 763 upper end of slot 760
- 767 lower end stop of slot 760
- 770 surface ridges on interior walls of primary housing
- 773 surface ridge upper end 773
- 777 space between surface ridge upper end and the upper end of primary housing
- 15 780 interior wall of primary housing
- 790 bolt/retention means
- 800 hole for bolt 790
- 900 helical compression spring
- 910 upper end of helical compression spring
- 20 920 lower end of helical compression spring
- 930 stop
- 940 interior opening in stop

- 950 wall against which lower end of spring is set
- 1000 second preferred embodiment inventive apparatus
- 1010 short shaft
- 1020 weight
- 5 1030 split grip assembly
- 1040 fixed upper grip portion
- 1050 slidable lower grip portion
- 1060 spring
- 1070 extension rod
- 10 1080 retention means to adjust and secure weight
- 1100 swing plane indicator boards
- 1110 toe line
- 1120 toe line inside edge
- 1130 toe line outside edge
- 15 1140 target line/clubhead line
- 1150 target line inside edge
- 1160 target line outside edge
- 1170 first fabric strap
- 1180 second fabric strap
- 20 1190 spaced apart slots
- 1200 distance between toe line and target line

DETAILED DESCRIPTION OF THE INVENTION

[0075] Referring to FIGS. 1 through 8, wherein like reference numerals refer to like components in the various views, there is illustrated therein a new and improved golf swing training apparatus, generally denominated 100 herein. FIGS. 9-14 illustrate the method of using

5 the inventive apparatus.

[0076] Collectively, FIGS. 1-8 show that the inventive apparatus 100 comprises a shaft 110 having a longitudinal axis 110a and including a clubhead end 120 and a grip end 130.

[0077] Affixed to the clubhead end in a first preferred embodiment is a weighted mass 140 of any type which will give the club swing weight characteristics of a conventional golf clubhead.

10 The mass need not be a conventional club. In fact, because the present invention is not intended for use in striking golf balls, it can be little more than a weight adapted to provide clubhead mass, and its particular shape is not essential to the training function of the apparatus. The mass is preferably weighted so that when assembled (but without added weight or light housings, described below), the balance, overall weight, and swing weight characteristics do not fall far

15 outside the range of conventional clubs. If the mass is a conventional clubhead, it may be either an iron head or a (metal)wood head. If it is desired to provide increased weight to train golf muscles, the present invention permits this option, as more fully described below. An installed clubhead may be suited for a right handed golfer or a left handed golfer, or it may have a neutral or two sided loft such that the device is suitable for use by right handed and left handed golfers alike.

20 [0078] Referring now to FIG. 3, the shaft 110 is preferably generally cylindrical at its ends, but includes a non-cylindrical medial portion 150 defined by a surface shape which is not uniformly round, which portion is contiguous and integral with the upper and lower cylindrical portions 160,

170, respectively, of the shaft. Preferably the non-cylindrical portion comprises tubing having the cross-sectional shape of a truncated cylinder 180 truncated on opposing sides (see FIGS. 3 and 5). However, any of a number of alternative non-cylindrical cross-sectional shapes may be employed, including square 182, triangular 184, figure-eight 186, hexagonal (or polygonal generally) 188, round with channel 190, or round with ridge 192. The non-cylindrical portion extends upwardly from the geometric center 110c of the shaft at least as to the lower end of the lower portion of the split grip (described *infra*); it may, but need not, extend downwardly from the geometric center of the shaft, as the length of the non-cylindrical portion defines the useful range of movement of the slidable grip, and this, in turn, is governed by the length of the shaft on 10 which the components of the system are assembled. In use, the non-cylindrical shaft on the present invention prevents any rotation of the grip portions as the hands separate and rejoin during swing drills.

**[0079]** Referring now to FIGS. 1, 2, 4, 6-7, and especially to FIGS. 2 and 4, affixed to the grip end 130 of the shaft 110 is a hollow split handle grip 200 having an fixed upper grip portion 210 having an upper end 220 and a lower end 230; and a slidable/non-rotatable lower grip portion 240 having an upper end 250 and a lower end 260. The upper grip portion is for gripping with the non-dominant hand in the golf swing (i.e., the left hand for a right-handed golfer, and the right hand for a left-handed golfer). The lower grip portion is adapted for gripping with the dominant hand (i.e., the right hand for a right-handed golfer, and the left hand for a left-handed golfer).  
20 Accordingly, the apparatus of the present invention is adapted for use in teaching conventional swing mechanics and would be ill-suited for teaching a cross-handed technique.

**[0080]** At the lower end 230 of the upper grip portion is a contoured upper grip expansion 270

having a thumb slot 280 oriented so as to ensure proper upper (subordinate) hand positioning by the golfer. Upper grip expansion 270 further includes a shield 290 behind which to position the thumb and the forefinger of the upper hand and thereby to protect them from being pinched when the two grip portions are joined after being separated during the swing. Upper grip portion further 5 includes a head 300 at its lower end 230, which is preferably rounded, and an opening 310, preferably threaded, and adapted for receiving an expandible collar 320, having threads matching those of opening 310, and having a throughhole 330 for insertion and retention of an extendable extension rod 340, adjustable with selective loosening and tightening of collar 320.

10 [0081] Slidable/non-rotatable lower grip portion 240 includes a contoured lower grip expansion 350 defining a recess or cup 360 for receiving and coupling with the head 300 of upper grip expansion 270. Lower grip expansion 350 further includes an upper edge 370 which approximates the shield 290 of the upper grip portion when the two grip portions are coupled. The lower grip expansion is contoured to accommodate the small finger of the lower hand and possibly a portion of the butt of the palm of the hand.

15 [0082] Again, referring particularly to FIGS. 4, 4A, and 4B, the cross-sectional shape of the upper grip portion interior wall 380 is substantially round, shaped to conform to the substantially cylindrical shape of the shaft 110 at its upper end 130, while the cross-sectional shape of the lower grip portion interior wall 390 is shaped to conform to the non-cylindrical portion 150 of the shaft 110. As noted, the non-cylindrical portion of the shaft may be any of a number of suitable 20 cross-sectional shapes. The functional objective of the conforming non-cylindrical shapes is to prevent rotation or turning of the lower grip portion as it is slid up and down the shaft during use.

[0083] Referring now to FIGS. 1, 2, 5-7, and particularly to FIG. 5, interposed between lower

grip portion 240 and clubhead 140 is a slide-stop/laser housing assembly 500, which includes a primary housing 510, and to which is attached secondary housing 520. The primary housing is preferably U-shaped when viewed on end, thus having a channel 515 extending the length of the housing and defining at least one interior surface 780. It includes at least one light emitting means, 5 preferably first and second lasers 530, 540, each having a threaded portion 550, 560, and inserted into bore holes 570, 580, each of which have threaded portions 590, 600, and which extend from the upper end 610 to the lower end 620 of primary housing. Light emitting means 530 and 540 generate first and second downwardly directed beams of light, 630, 640, for generating a beam of light downwardly toward and alongside either side of clubhead 140 and substantially parallel to 10 the longitudinal axis 110a of the shaft 110. Depending on which side the golfer plays from, the golfer will generally elect to install one laser on one side of the shaft to direct a beam either in front of or behind the clubface, according to his or her preference. For all practical purposes, using both first and second lasers simultaneously provides no advantage over using one alone, and it is contemplated that use of the apparatus will entail the use of only one downwardly directed 15 beam of light and only one upwardly directed beam of light, either together or one at a time. It is generally contemplated that golfers will elect to have the downward beam directed in front of the clubface as this is the point of visual focus and there is less physical clubhead mass in front of the shaft than there is behind the shaft (this is particularly true of woods/metal woods).

[0084] The secondary housing 520 includes third light emitting means, preferably a third laser 20 650, which produces an upwardly directed beam of light 660 directed upwardly toward and alongside split handle grip 200. The third laser preferably includes a threaded portion 670 adaptable for threadable insertion into a throughhole 680, having a threaded portion (not shown)

and which extends the length of the secondary housing.

[0085] It should be noted that the present invention provides considerable flexibility in exchanging weights for the light emitting means, such that first, second, and third light emitting means 530, 540, and 650, can be replaced with weights so that the user can focus on swing 5 muscle development, rather than swing plane control. Accordingly, one or more of the light emitting means, alone or in any combination, can be replaced with weights having the same means of threadable insertion into the respective threaded bore holes.

[0086] The primary housing 510 includes mounting means 690, preferably a retainer having slots or openings, and secondary housing means includes an integral arm or spacer 700 which 10 separates secondary housing 520 from the primary housing a distance sufficient to allow the third beam of light 660 to pass by the user's hands when in use. Spacer 700 includes fastening means, preferably a quick-disconnect snap-fit plastic bracket 710 adapted for attachment to retainer 690.

[0087] First, second, and third, light emitting means includes first through third switches 720, 730, (third not shown) for selective use of each light source. As an alternative to installing light emitting means in any one of bore holes 570, 580, and 680, the holes could be left empty, or a 15 device other than a light could be inserted, for example weighted material (weights). It is contemplated that in use, some golfers at times will prefer working with weights alone to train muscle strength and stamina, or to work with weights in combination with one or more lights. Thus, any combination of weights and lights, lights alone, or weights alone can be employed, 20 depending on the user's preferences. The weighted material is preferably shaped identically to the illustrated lasers and may be provided in a variety of masses, from only a few ounces to well over a pound.

[0088] Mounted on the non-cylindrical shaft portion of shaft 110 is a keeper 740, preferably substantially cuboidal and having substantially rectangular sides, and having an interior hole 745 conforming in shape to the non-cylindrical surface of shaft 110. Keeper 740 includes mounting means, preferably slots 750, 760, each having an upper end opening 753, 763, and a lower end 5 stop 757, 767, and each adapted for slidable coupling with complementary surface ridges 770 disposed on the interior surface 780 of primary housing 510. The surface ridges extend upwardly to a surface ridge upper end 773 which leaves a space 777 between the surface ridge upper end and the upper end 610 of primary housing.

[0089] The keeper further includes retention means, preferably a bolt 790, threadably inserted 10 into a hole 800 in the upper side of the keeper. This provides a way to adjust and secure the position of the keeper anywhere along the non-cylindrical portion of the shaft.

[0090] As shown in FIGS. 1-2, 6-7, interposed between the lower end 260 of lower grip 15 portion 240 and primary housing 510 is a biasing means, preferably a helical compression spring 900, and more preferably a helical compression spring with squared and ground ends. The spring terminates at its upper end 910 at the lower end 260 of lower grip portion 240, and it terminates at its lower end 920 at a stop 930. Generally, the spring urges the lower grip portion into contact with the upper grip portion as long as there is no force present separating the grip portions from one another.

[0091] Stop 930 is shaped and sized to nest within channel 515 and space 777 of primary 20 housing 510 (see esp. FIGS. 1, 5, and 7). Stop 930 includes an interior opening 940 having a spring-containing portion shaped to allow insertion of at least a portion of the terminal end of spring 900 so as to contain the end, and a shaft-engaging portion having a shape conforming to

the non-cylindrical portion of shaft 110. The boundary of these two portion is defined by a wall 950 against which the lower end of spring 900 is set.

[0092] When assembled, primary housing 510 is mounted directly on the keeper and thus indirectly on the shaft. To assemble the slide-stop/laser housing assembly 500 on the shaft, the keeper 740 is first secured at a point along the shaft which defines the length the user wishes to be able to extend the slideable lower grip portion 240 during use. The stop 930 is then slid up the shaft, compressing spring 900 to clear sufficient room to place the shaft in the channel 515 of the primary laser hosing such that the primary housing is between the stop 930 and the keeper 740. The primary housing is then slid down over the keeper so that surface ridges 770 engage slots 750, 760 and until stopped by stop ends 757, 767 of slots 750, 760. The stop 930 is then slid down until it nests in space 777 and is substantially flush with the upper end 610 of primary housing 510. The spring is then allowed to press against stop 930 and urge it to remain in place. Lights and/or lasers may then be installed, if not already installed, according to the user's preferences, as explained *supra*.

[0093] Referring now to FIG. 7, in use the golfer may slide lower grip portion 240 a distance 960 as defined by the distance between the lower end 260 of lower grip portion 240 and the stop 930, and by the compressibility of spring 900.

[0094] FIG. 8 is a perspective view of a second preferred embodiment 1000 of the swing training apparatus of the present invention. This is the compact version of the inventive apparatus. It is useful for practicing while traveling or in rooms with low ceilings. A long shaft is replaced with a short shaft 1010 and instead of the slide-stop/laser housing assembly, a weight 1020 and/or a laser (or other suitable light emitting means) is mounted at the end of the shortened shaft. In this

instance, the light emitting means provides a beam of light substantially coaxially with the longitudinal axis of the shaft. As with the first preferred embodiment, a split grip assembly 1030 is provided, including a fixed upper grip portion 1040 and a slidable lower grip portion 1050. Spring 1060 is interposed between the grip and the weight/laser, in the same manner that the spring is 5 interposed between the grip and the primary housing in the first preferred embodiment. An adjustable extension rod 1070 may also be provided.

[0095] When equipped with a weight, the weight includes retention means 1080 to adjust the position of the weight on the shaft and thereby to control the range of motion of the slidable lower grip portion of the slidable lower grip.

10 [0096] The operation of the second preferred embodiment is identical in every respect to that of the first preferred embodiment, with the exception that light emitting means may be used at the option of the user. The emphasis in this embodiment is on training arm and wrist motions, rather than on swing plane control.

[0097] FIG. 9 is a perspective view of the swing plane indicator boards (alignment boards) 1100 15 employed in connection with the inventive swing training aid to provide a swing training method. The alignment boards include a toe line 1110 having a toe line inside edge 1120 and a toe line outside edge 1130. When in use, the toe line outside edge is positioned immediately next to the toes of the golfer.

[0098] The alignment boards further include a clubhead line (or target line) board 1140, having 20 a target line inside edge 1150 and a target line outside edge 1160. The toe line and target line are joined by flexible material, preferably first and second fabric straps 1170, 1180 adjustably attached to each board through spaced-apart slots 1190. The distance 1200 between the alignment boards

can be adjusted to accommodate golfers of different sizes and golfers employing clubs of different lengths, thus causing the user to stand further from or closer to the ball.

[0099] FIGS. 10-14 show the method of teaching swing mechanics and swing plane control using the present inventive apparatus. FIG. 10 is a side perspective view showing a golfer G at address, holding the swing training apparatus 100 of the present invention and standing relative to a toe line and a target line employed in the present inventive method. In this view, either the first beam of light 630 (or the second beam of light, at the discretion of the user) is shining directly on the target line.

[0100] FIG. 11 is a front perspective view of the golfer beginning the swing takeaway. The first beam of light 630 (again, alternatively, the second beam of light) is still directed at the target line 1140. The golfer has not yet begun to slide the slidable lower grip portion significantly away from upper grip portion of the split grip.

[0101] FIG. 12 is a front perspective view showing the golfer with his hands at approximately hip height in the backswing and beginning to split his hands by sliding the slidable lower grip portion 240 of the split grip 200 away from the fixed upper grip portion 210, thereby causing spring 900 to compress as it is urged against the stop nested within the primary housing 510. This view also shows use of the extension rod 340 in conjunction with lasers to assist in visualizing proper swing plane motion. Use of the extension rod is particularly desirable in bright daylight conditions, when it is difficult to see the light beams trace the alignment boards.

[0102] It will be noted that at this point in the swing (after the club has passed the parallel position in the backswing), the plane line has shifted from the target line 1140 to the toe line 1110, and third light beam 660 emitted from the laser in the secondary housing is directed to the

toe line, rather than the target line. This marks the shift in plane lines discussed above, and appreciation of this fact is a novel recognition in the world of golf instruction; use of it as a controlling concept is also unique in the world of golf instruction.

[0103] FIG. 13 is a side perspective view of the golfer shown in FIG. 12, which is substantially the same as would be seen in a golfer in the “wait hit” position in the downswing. In this view the golfer’s hands are separated to facilitate proper left arm structure, maintain swing arc width, and induce proper wrist cock in the backswing, or to maintain wrist cock, delay the release, and maintain swing arc width in the downswing. Lower grip portion 240 is separated from upper grip portion 210, and spring 900 is partly loaded, or compressed. Light beam 660 is directed at the toe line, while light beam 630 is directed upwardly and is not directly employed for plane control at this point.

[0104] It must be emphasized that use of the side-by-side parallel lines, toe and target, provides a unique feature of the inventive method. In most known swing plane teaching methods, it is generally taught that the plane line remains in place at the target line. More accurately, most purported swing plane training techniques do not actually utilize the concept of a plane at all, but appear to suggest that a line extending from the clubshaft would trace an arc on the ground as it moved both back from the ball in the backswing to toward the ball in the downswing and into impact (see, e.g., the ‘592 patent to Laffer, discussed above). However, in the present invention, the novel method entails tracking different plane lines after the club passes the generally hip-height parallel position in both the backswing and the downswing. In the backswing, once the club has reached parallel, the wrists begin to cock and the line traced by the third beam of light shifts from the target line to the toe line. Then, after reaching the parallel position at the top of the swing, the

third beam of light (directed up the shaft toward the hands) traces the toe line on the way down until the club reaches parallel and the wrists uncock, when the first or second beam of light (directed down the shaft) begins to trace the target line and does so through and after impact.

5 [0105] FIG. 14 is a superimposed front perspective view showing three positions of the golfer using the inventive apparatus in a swing, including the top of the backswing, the position approximately halfway into the downswing, and a point slightly after impact. Using the principles set forth above, it will be readily apparent how the light beams are employed throughout the full swing to monitor and control the swing plane, and further how the split grip is employed throughout the swing to facilitate proper arm and wrist action and structure.

10 [0106] The inventive apparatus may be employed to teach swing fundamentals in a novel way. Pared down to its essential elements, the inventive apparatus comprises a shaft having a longitudinal axis, a clubhead end, and a grip end; a split-handled grip affixed to said grip end with which a golfer holds said apparatus, said grip including a fixed upper grip portion with an upper end and a lower end, and a slidable lower grip portion having an upper end and a lower end, said 15 fixed upper grip portion for gripping with the non-dominant hand in the golf swing and said slidable lower grip portion adapted for gripping with the dominant hand; a weighted mass affixed to said clubhead end, said weighted mass selected from the group consisting of a golf clubhead and a weight; a primary housing affixed to said shaft between said grip and said weighted mass and having at least one throughhole for removable insertion of either light emitting means or a 20 swing weight; first light emitting means removably inserted into one of the throughholes in said primary housing for directing a first beam of light downwardly and toward said clubhead end of said shaft and substantially parallel to said longitudinal axis of said shaft; a secondary housing

removably attached to said primary housing, said secondary housing having a throughhole for removable insertion of light emitting means; second light emitting means removably inserted into the throughhole in said secondary housing for directing a second beam of light upwardly and toward said grip end of said shaft and substantially parallel to said longitudinal axis of said shaft; 5 and biasing means interposed between said lower end of said slidable lower grip portion and said primary housing, said biasing means urging said slidable lower grip portion into contact with said fixed upper grip portion when no force is applied to said slidable lower grip portion to separate it from said fixed upper grip portion. The position of the primary housing is adjustable on said shaft and defines the range of possible motion of said slidable lower grip portion.

- 10 [0107] The inventive teaching method comprises the steps of: (a) providing the swing training apparatus as set out in the immediately preceding paragraph; (b) adjusting the position of the primary housing on the shaft; (c) installing the first light emitting means in one of the throughholes in the primary housing; (d) installing the second light emitting means in the throughhole in the secondary housing; (e) switching on the first and second light emitting means; (f) while holding 15 the slidable lower grip portion with the dominant hand and the fixed upper grip portion of the non-dominant hand, addressing a pre-selected ball location and aiming at a target; (g) executing the initial motions of the backswing, and while so moving tracing the target line with the downwardly directed beam of light until the shaft is parallel to the plane of the ground; (h) continuing execution of the backswing, and while so moving tracing the toe line with the 20 upwardly directed beam of light until the top of the backswing is reached; (i) during either or both of steps (g) and (h), separating the slidable grip portion from the fixed grip portion a desired distance; (j) executing the initial motions of the downswing until the shaft is parallel to the plane

of the ground; (k) executing the wrist uncocking phase of the downswing, and while so moving tracing the target line with the downwardly directed beam of light to and through impact until the shaft is parallel to the plane of the ground; and (l) during either or both of steps (j) and (k), moving the slidable lower grip portion closer to the fixed upper grip portion so that as the 5 weighted mass at the clubhead end of the shaft passes through the ball location, the slidable lower grip portion is in contact with the fixed upper grip portion.

[0108] As an alternative, the foregoing method may also include the step of tracing the toe line with the upwardly directed beam of light during step (j). As yet another alternative, the method of may include the step of tracing the target line with the upwardly directed beam of light 10 during step (j).

[0109] A slightly less involved but nonetheless novel method of teaching proper swing mechanics and swing plane compliance comprises: (a) providing a golf swing training apparatus as described above, but not having a split-handled grip; (b) providing at least one pair of spaced-apart swing plane indicator lines including a toe line and a target line; (c) installing first light emitting means in one of the throughholes in the primary housing; (d) installing second light emitting means in the throughhole in the secondary housing; (e) switching on the first and second light emitting means; (f) addressing a pre-selected ball location and aiming at a target; (g) executing a backswing, and while so moving tracing the target line with the downwardly directed beam of light until the shaft is parallel to the plane of the ground; (h) continuing execution of the 15 backswing, and while so moving tracing the toe line with the upwardly directed beam of light until the top of the backswing is reached; (i) executing the initial motions of the downswing until the shaft is parallel to the plane of the ground; and (j) executing the wrist uncocking phase of the 20

downswing, and while so moving tracing the target line with the downwardly directed beam of light to and through impact until the shaft is parallel to the plane of the ground.

5 [0110] An alternative to the method described in the immediately preceding paragraph would further include the step of tracing the toe line with the upwardly directed beam of light during step (i). Yet another alternative would entail tracing the target line with the upwardly directed beam of light during step (i).

10 [0111] The above disclosure is sufficient to enable one of ordinary skill in the art to practice the invention, and provides the best mode of practicing the invention presently contemplated by the inventor. While there is provided herein a full and complete disclosure of the preferred embodiments of this invention, it is not desired to limit the invention to the exact construction, dimensional relationships, and operation shown and described. Various modifications, alternative constructions, changes and equivalents will readily occur to those skilled in the art and may be employed, as suitable, without departing from the true spirit and scope of the invention. Such changes might involve alternative materials, components, structural arrangements, sizes, shapes, 15 forms, functions, operational features or the like. Additionally, directional terms have been employed with the intention to simplify the disclosure, and to that end a right-handed model has been used to illustrate the inventive apparatus. However, it will be readily appreciated that the present invention as described is perfectly suitable for use by left-handed golfers as well without any alteration of the functional or structural features of the apparatus.

20 [0112] Therefore, the above description and illustrations should not be construed as limiting the scope of the invention, which is defined by the appended claims.